

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 10236-9 (1983): Procedure for basic climatic and durability test for optical instruments, Part 9: Low air pressure (altitude) test [PGD 22: Educational Instruments and Equipment]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard

PROCEDURE FOR
BASIC CLIMATIC AND DURABILITY TESTS
FOR OPTICAL INSTRUMENTS

PART 9 LOW AIR PRESSURE (ALTITUDE) TEST

UDC 681.7 : 620.162.4



© Copyright 1983

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART 9 LOW AIR PRESSURE (ALTITUDE) TEST

Optical and Mathematical Instruments Sectional Committee, EDC 36

Chairman

LT-GEN K. L. KHOSLA

Representing

The Institution of Surveyors, New Delhi

Members

MAJ GEN G. C. AGARWAL

Survey of India, Dehra Dun

COL M. G. ARUR (*Alternate*)

COL M. S. BOPARAI

Directorate General of Armed Forces Medical
Services, Ministry of Defence

SHRI J. CHOUDHURI

National Instruments Ltd, Calcutta

SHRI A. K. GHOSHAI, (*Alternate*)

LT-COL S. K. GAUR

Ministry of Defence (DGI)

LT-COL JOGINDER MOHAN (*Alternate*)

SHRI M. M. GUPTA

Ministry of Defence (DGOF)

DR R. HRADAYNATH

Ministry of Defence (R & D), Dehra Dun

SHRI M. V. RAO (*Alternate*)

SHRI P. K. JAIN

Directorate of Industries, Government of Haryana,
ChandigarhSHRI D. D. KHOSLA (*Alternate*)

SHRI D. B. MALIK

Directorate General of Technical Development,
New DelhiSHRI MOHAN JEET SINGH (*Alternate*)

LT CDR A. G. MODAK

Chief Hydrographer to the Government of India,
Dehra Dun

DR E. K. MURTHY

Central Scientific Instruments Organization
(CSIR), ChandigarhSHRI H. C. ASIJA (*Alternate*)

DR S. RANGANATHAN

Madras Institute of Technology, Madras

DR K. V. S. R. APPA RAO

Bhabha Atomic Research Centre, Bombay

SHRI R. P. SHUKLA (*Alternate*)

SHRI C. NARAYANA RAO

Bharat Electronics Ltd, Machilipatnam

SHRI A. M. JOSE (*Alternate*)(*Continued on page 2*)

© Copyright 1983

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

| <i>Members</i> | <i>Representing</i> |
|--|---|
| REPRESENTATIVE | Institution of Mechanical Engineers (India), Bombay |
| SHRI S. K. ROY | Electro-Photonics India Pvt Ltd, Hyderabad |
| SHRI R. K. DUGGAL (<i>Alternate</i>) | |
| DR D. SEN | National Physical Laboratory (CSIR), New Delhi |
| SHRI RAM PRASAD (<i>Alternate</i>) | |
| SHRI S. P. SINGH | Research, Designs & Standards Organization (Ministry of Railways), Lucknow |
| SHRI K. SANTHANAM (<i>Alternate</i>) | |
| SHRI J. K. SONEJA | All India Instrument Manufacturers' and Dealers' Association, Bombay |
| SHRI C. L. BATRA (<i>Alternate</i>) | |
| LT-COL SUKHDEV SINGH | Ministry of Defence (EME) |
| MAJ T. V. RAMAKRISHNAN (<i>Alternate</i>) | |
| SHRI H. C. VERMA | Associated Instrument Manufacturers (India) Pvt Ltd, New Delhi |
| SHRI K. G. PURANG (<i>Alternate</i>) | |
| SHRI M. K. VERMA | Development Commissioner, Small Scale Industries, New Delhi |
| SHRI K. S. LAMBA (<i>Alternate</i>) | |
| SHRI S. CHANDRASEKHARAN, Director (Mech Engg) | Director General, ISI (<i>Ex-officio Member</i>) |

Secretary

SHRI S. P. ABBEY
Senior Deputy Director (Mech Engg), ISI

**Panel for Basic Climatic and Durability Tests for Optical
Instruments, EDC 36/P-1**

| | |
|--|--|
| SHRI BHAGWAN SINGH | Ministry of Defence (R & D), Dehra Dun |
| SHRI C. L. JATAV (<i>Alternate</i>) | |
| SHRI A. K. GHOSHAL | National Instruments Ltd, Calcutta |
| LT-COL JOGINDER MOHAN | Ministry of Defence (DGI) |
| SHRI U. P. S. ASWAL (<i>Alternate</i>) | |
| SHRI S. P. ROY | Survey of India, Dehra Dun |
| SHRI SURESH CHAND (<i>Alternate</i>) | |
| SHRI G. K. SACHDEV | Ministry of Defence (DGOF), Dehra Dun |

Indian Standard

PROCEDURE FOR BASIC CLIMATIC AND DURABILITY TESTS FOR OPTICAL INSTRUMENTS

PART 9 LOW AIR PRESSURE (ALTITUDE) TEST

0. FOREWORD

0.1 This Indian Standard (Part 9) was adopted by the Indian Standards Institution on 28 September 1983, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Fast development in the field of instruments had brought a significant change in their basic content and design. It has been felt over the years that IS : 2352-1963* does not cater for the present day needs of the instruments and is also not in line with the recent trends in climatic and environmental testing procedures to be adopted for improving their quality and reliability. It has, therefore, become necessary to have uniform and more rational testing procedures as far as possible. This series of standards on climatic and durability test (IS : 10236) has been prepared with this objective.

0.2.1 It is proposed to withdraw the existing Indian Standard (IS : 2352-1963*) as soon as the tests mentioned therein are covered in this new series of IS : 10236.

1. SCOPE

1.1 This standard (Part 9) covers the procedure for conducting low air pressure (altitude) test for optical instruments.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 10236 (Part 1)† shall apply.

*Procedure for basic climatic and durability tests for optical instruments.

†Procedure for basic climatic and durability tests for optical instrument : Part 1 General (*under preparation*).

3. OBJECT

3.1 The object of this test is to determine suitability of optical instruments to withstand and operate under conditions of (a) low air pressure or (b) low air pressure combined with low temperature, such as would be encountered at high altitudes.

4. INITIAL MEASUREMENT

4.1 The instrument shall be visually examined and optically, electrically and mechanically checked as required by the relevant instrument specification.

5. TEST CHAMBER

5.1 The chamber used for this test shall meet the requirements specified in **5.1.1** to **5.1.4**.

5.1.1 The chamber shall be capable of maintaining its working space at any low pressure as desired by the required severity with a tolerance of ± 5 percent.

5.1.2 The chamber shall have facility for restoration of low pressure to normal laboratory conditions within 5 to 30 minutes.

5.1.3 In addition, when testing under condition (b) of **3.1** is required, the chamber shall be capable of maintaining its working space at any low temperature appropriate to the required severity with a tolerance of $\pm 3^{\circ}\text{C}$.

5.1.4 Care shall be taken to ensure that any heat dissipation of the specimen shall not appreciably influence the conditions in the chamber.

5.1.5 The chamber shall have provision to supply electric power to the specimen under test from external source.

5.1.6 The chamber shall have a provision of a suitable viewing window to see functioning of the instrument, if required.

6. TEST SEVERITY

6.1 The test severities shall be chosen from those given below:

a) *Low Pressure*

| Altitude m | Pressure | |
|---------------|----------|-------|
| | mm of Hg | kPa |
| 26 000 | 15.0 | 2.0 |
| 20 000 | 33.0 | 4.4 |
| 16 000 | 64.0 | 8.5 |
| 13 200 | 112.5 | 15.00 |
| 8 500 | 225.0 | 30.0 |
| 4 300 | 400.0 | 53.3 |
| 3 500 | 450.0 | 60.0 |

NOTE — Accuracy for low air pressure shall be ± 5 percent.

b) *Low Temperature*

- 1) $-55 \pm 3^{\circ}\text{C}$
- 2) $-40 \pm 3^{\circ}\text{C}$
- 3) $-20 \pm 3^{\circ}\text{C}$
- 4) $-10 \pm 3^{\circ}\text{C}$

7. TEST PROCEDURE

7.1 Procedure 1 — Low Air Pressure

7.1.1 The instrument shall be subjected to this test in the unpacked condition.

7.1.2 The instrument under test, while being under laboratory atmospheric conditions, shall be introduced into the chamber, the later also being under the same conditions.

7.1.3 The air pressure inside the chamber shall be brought down to a value corresponding to the specified low pressure severity or any other severity as specified in the relevant instrument specification.

7.1.4 The instrument shall remain inside the chamber for a period of 4 or 8 hours or for any other period prescribed in the relevant instrument specification.

7.1.5 The instrument shall be operating during conditioning if required in the relevant instrument specification.

7.1.6 If the instrument is not operating during conditioning at the end of the period of exposure the electrical/electronic arrangement fitted in the instrument shall be checked for its functioning, if required by the relevant instrument specification.

7.1.7 The air pressure inside the chamber shall now be restored to laboratory pressure conditions within a period of 15 to 30 minutes or as specified by relevant instrument specification.

7.1.8 Recovery — The instrument shall then be removed from the chamber and shall be allowed to remain under standard atmospheric conditions for recovery for a period of 1 to 2 hours.

7.2 Procedure 2 — Low Temperature/Low Air Pressure

7.2.1 The instrument shall be subjected to this test in unpacked condition.

7.2.2 The instrument under test, while being under laboratory atmospheric conditions shall be introduced into the chamber, the later also being under the same conditions.

7.2.3 The temperature of the chamber shall be lowered to the low temperature severity as specified in the relevant instrument specification.

7.2.4 On attaining low temperature the air pressure inside the chamber shall be brought down to a value corresponding to the specified low pressure severity as specified in the relevant instrument specification.

7.2.5 The instrument shall remain inside the chamber for a period of 4 or 8 hours or for any other period prescribed in the relevant instrument specification.

7.2.6 The instrument shall be operating during conditioning, if required in the relevant instrument specification.

7.2.7 If the instrument is not operating during conditioning, at the end of the period of exposure the electrical/electronic arrangement fitted in the instrument shall be checked for its functioning, if required by the relevant instrument specification.

7.2.8 The temperature of the chamber shall then be allowed to rise at such a rate that it would attain laboratory conditions in not less than one hour nor more than 4 hours.

7.2.9 When the temperature of the chamber has reached a value between 0 to 10°C, the air pressure inside the chamber shall be restored to laboratory atmospheric conditions within a period of 15 to 30 minutes or as specified by the relevant instrument specification.

NOTE — The air shall be dried as much as possible to minimise condensation on the instruments when restoring conditions after low temperature and low air pressure.

7.2.10 Recovery — The instrument shall then be removed from the chamber and allowed to remain under standard atmospheric conditions for not less than one hour nor more than two hours. It shall then be shaken by hand to remove droplets of water (if any) and shall be further kept for one to two hours under standard atmospheric conditions for recovery.

8. FINAL MEASUREMENTS

8.1 After recovery the instrument shall be visually examined and tested for its performance in accordance with the relevant instrument specification and in case of tropicalised instruments also for leaks.

9. DETAILS TO BE GIVEN IN RELEVANT INSTRUMENT SPECIFICATION

9.1 The relevant instrument specification shall state the following for carrying out this test:

- a) Initial observations/measurements;
- b) Procedure to be adopted;
- c) Low air pressure severity;
- d) Low temperature severity, in case of procedure 2;
- e) Duration of conditioning;
- f) Whether instrument shall be operating during conditioning;
- g) Functioning tests to be carried out for electrical/electronic arrangement during conditioning, if so required;
- h) Period of restoration of air pressure if other than specified;
- j) Final observations/measurements; and
- k) Any deviation from the normal procedure.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

| QUANTITY | UNIT | SYMBOL |
|---------------------------|----------|--------|
| Length | metre | m |
| Mass | kilogram | kg |
| Time | second | s |
| Electric current | ampere | A |
| Thermodynamic temperature | kelvin | K |
| Luminous intensity | candela | cd |
| Amount of substance | mole | mol |

Supplementary Units

| QUANTITY | UNIT | SYMBOL |
|-------------|-----------|--------|
| Plane angle | radian | rad |
| Solid angle | steradian | sr |

Derived Units

| QUANTITY | UNIT | SYMBOL | DEFINITION |
|----------------------|---------|--------|---------------------------------|
| Force | newton | N | 1 N = 1 kg.m/s ² |
| Energy | joule | J | 1 J = 1 N.m |
| Power | watt | W | 1 W = 1 J/s |
| Flux | weber | Wb | 1 Wb = 1 V.s |
| Flux density | tesla | T | 1 T = 1 Wb/m ² |
| Frequency | hertz | Hz | 1 Hz = 1 c/s (s ⁻¹) |
| Electric conductance | siemens | S | 1 S = 1 A/V |
| Electromotive force | volt | V | 1 V = 1 W/A |
| Pressure, stress | pascal | Pa | 1 Pa = 1 N/m ² |